

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: **86201420.6**

(51) Int. Cl.⁴: **E01C 19/52**, **E01C 23/12**,
E01C 19/00

(22) Date of filing: **13.08.86**

(43) Date of publication of application:
24.02.88 Bulletin 88/08

(84) Designated Contracting States:
BE DE FR GB NL

(71) Applicant: **T.B. Polak, handelende onder de naam INTERNATIONAL EFFICIENT PRODUCTS**
Kalkoven 1
NL-9351 NP Leek(NL)

(72) Inventor: **Everaarts, Arie Johannes**
Freerik Bosgraafstraat 8
NL-9251 CT Bergum(NL)

(74) Representative: **Smulders, Theodorus A.H.J. et al**
Vereenigde Octrooibureaux Nieuwe Parklaan 107
NL-2587 BP 's-Gravenhage(NL)

(54) **A method of re-paving roads paved with paving stones or bricks, and apparatus for the application of the method.**

(57) A method of, and apparatus for re-paving roads paved with paving stones or bricks, in which the stones or bricks are taken up from the existing paving (1), cleaned and stored, the sand bed (2) is prepared, and the stones or bricks are re-layed. According to the invention, the cleaned stones or bricks are supplied to a mobile pattern forming machine (7) positioned on the sand bed (2) between the old paving (1) and a part of the road already re-paved (5). In the mobile pattern forming machine the stones or bricks are automatically and one by one passed along a visual inspection station and put in a desired position. Subsequently they are automatically supplied to a section of a pattern forming table constituting part of the pattern forming machine (7), where the stones or bricks are automatically formed into laying units. These units are stacked alongside the road and subsequently picked up by a paving machine (12) positioned on a portion of the pavement already re-paved (5), and laid on the meanwhile levelled sand bed (2) between the mobile pattern forming machine (7) and the re-paved road surface (5).

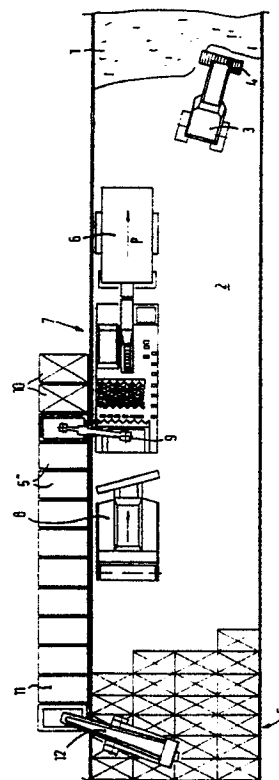


fig 1

A method of re-paving roads paved with paving stones or bricks, and apparatus for the application of the method.

This invention relates to a method of re-paving roads paved with paving stones or bricks, in which the stones or bricks are taken up from the existing paving, cleaned and stored, the sand bed is prepared, and the stones or bricks are re-laid.

A method of this kind is known from practice. Although machinery is used for taking up the existing paving and cleaning the stones or bricks, namely, a shovel provided with a so-called rotor cleaner for cleaning the stones or bricks, and the sand bed is also often levelled mechanically, nearly all other operations in the re-paving process are carried out by hand, as a result of which road repavement is a time-consuming and physically heavy work.

There is accordingly a need for such a method that roads can be re-paved more quickly and with less effort. It is an object of the present invention to provide such a method, and also apparatus for the application of the method.

For this purpose, according to the invention, a method of the kind described is characterized in that the cleaned stones or bricks are supplied to a mobile pattern forming machine positioned on the sand bed between the old paving and a part of the road already re-paved, and that the stones or bricks in said mobile pattern forming machine are automatically and one by one passed along a visual inspection station and put in a desired position and subsequently automatically supplied to a section of a pattern forming table constituting part of said pattern forming machine, where the stones or bricks are automatically formed into laying units which are stacked alongside the road and subsequently picked up by a paving machine positioned on a portion of the pavement already re-paved, and laid on the meanwhile levelled sand bed between the mobile pattern forming machine and the re-paved road surface.

An apparatus for applying the method is characterized, according to the present invention, by a hopper, a first conveyor for supplying stones or bricks from the hopper to a visual inspection station; means for putting the stones or bricks in a desired position and supplying them to a dimensional inspection station; and a conveyor for supplying the stones or bricks with the correct dimensions to a pattern forming table for forming a plurality of stones or bricks into a laying unit.

The invention will be described in more detail hereinafter with reference to the accompanying drawings. In said drawings

Fig. 1 illustrates diagrammatically the method according to the present invention;

Fig. 2 shows a top plan view of an apparatus according to the present invention; and

Fig. 3 shows the apparatus of Fig. 2 in side-elevational view.

Fig. 2 shows in top plan view a section of a road being re-paved using the method according to the present invention. On the right-hand side in the figure, the existing paving 1, formed of paving stones or bricks, is removed from the sand bed 2 by means of a shovel 3, which is provided with a rotor cleaner 4 for cleaning the stones or bricks picked up for them to be re-used for re-paving the road.

On the left-hand side, the figure shows a re-paved road portion designated 5.

When the rotor cleaner contains sufficient stones or bricks, it is closed and put into operation. The stones or bricks are then cleaned of sand and dirt. Subsequently, the clean stones or bricks are poured into a hopper 6 of a mobile pattern forming machine 7 according to the present invention. The mobile pattern forming machine for paving stones or bricks is positioned on the sand bed 2 between the old paving 1 and the new paving 5. The mobile pattern forming machine is disposed some distance from the new paving to leave sufficient space for levelling the intermediate portion of the sand bed by means of a leveller 8. During the work the mobile pattern forming machine moves in the direction of arrow

The mobile pattern forming machine comprises hopper 6, referred to hereinbefore, conveying means for moving the stones or bricks stored in the hopper to an inspection station; and a device for putting the stones or bricks in a correct position; a measuring station; and a pattern forming table for forming the stones or bricks into laying units.

When the stones or bricks have been formed into laying units, the units are picked up by means of a crane 10, equipped with appropriate clamping means, and stacked alongside the road on pallets 11. Preferably, the crane forms part of the mobile pattern forming machine, but it is also possible to use a separate crane.

In this way, stacks of laying units 11 are formed by the road side. The laying units are subsequently picked up one by one by a paving device 12 positioned on the part of the road already re-paved, and put on the levelled sand bed at the desired location. In this way the mobile pattern forming machine and the paving device move along the road until it is fully re-paved.

In principle, the method according to the invention can be carried out with a gang of four, which number can be reduced still further by, for example, operating shovel 3 and the leveller alternately by one and the same man, or by having the leveller and the paving device operated by one and the same man.

The mobile pattern forming machine according to the invention is diagrammatically shown in more detail in Figs. 2 and 3. The pattern forming machine is a self-propelled machine comprising a tracked frame 20, which is preferably detachably coupled to a second frame 21 having separate wheels and carrying hopper 6. Hopper 6 can be pivoted upwards as shown dotted in Fig. 3 to deposit the cleaned stones or bricks present in the hopper on a conveyor, which in the example shown comprises a pair of conveyors 22, 23 linking up one with the other. Conveyors 22, 23 supply the stones or bricks to a second, much smaller hopper 24. From the second hopper, a third conveyor 25 leads diagonally upwards to the inspection station. The third conveyor 25 has a width approximately corresponding to the length of a paving stone or brick, and hopper 24 is of corresponding width at the third conveyor, so that the stones or bricks are more or less forced to occupy such a position that they come to lie transversely to the third conveyor. If necessary, this can be promoted by using a vibrating mechanism, not shown, coupled to the hopper. Furthermore, the third conveyor is preferably provided with partitions as shown as 26, adjacent pairs of which form a compartment accommodating a stone or brick in a transverse position.

Next to the small bunker and the third conveyor is a cab 27 for the operator, who visually inspects the stones or bricks supplied by the third conveyor before these are ejected laterally off the conveyor by means of an ejecting mechanism 28 to land in a tipping device 29.

The visual inspection serves to determine whether the stones or bricks supplied are still suitable for re-use and to determine the position of each stone or brick. Depending on the position of each stone or brick supplied to the tipping device, the operator operates a button to cause the stone or brick to be tipped about its longitudinal axis such a number of times that it comes to lie with the correct side up. The tipping device comprises a transport part extending next to the third conveyor, but substantially horizontally and in the opposite direction, as indicated by an arrow 30, and alongside which means are provided for tipping the stones or bricks a correct number of times. When a stone or brick has been brought into its correct position, the stone or brick is automatically moved by one or more ejecting members 31 from the tipping device on to a juxtaposed conveyor 32,

which in this example has the same direction of transport, indicated by an arrow 33, and supplies the stones or bricks to a dimensional inspection station 34.

If the operator does not press a button, the stone or brick in question is regarded as unfit for use, and no ejector member is energized. The stone or brick is then carried off by the tipping mechanism to a waste container 35. This is the case, for example, with broken stones or bricks.

In the dimensional inspection station, each stone or brick is automatically checked for the correct dimensions. After the dimensional inspection station, stones or bricks with the correct dimensions are moved by an ejector 36 on to a juxtaposed conveyor 37 extending approximately horizontally, but in the rearward direction. Stones or bricks not having the correct dimensions, however, are not moved on to conveyor 37, but are also supplied to waste container 35.

The conveyor extends up to beyond a pattern forming table 38 positioned behind cab 27. At the level of the pattern forming table, the stones or bricks supplied by conveyor 37 are moved by an ejector 39 laterally off conveyor 37 on to a conveyor 40 extending in the transverse direction, which causes the stones or bricks to be laid in the correct position and with the desired longitudinal spacing. When, in this way, a row of stones or bricks has been formed, it is bodily pushed against the stones or bricks already arranged, by a hydraulically operated pusher beam 41. At the same time the stones or bricks are pushed into the desired pattern.

Fig. 2 shows a fishbone pattern, and the pusher beam and a retaining beam 42 are shown to be of stepped configuration. Other patterns, however, can be formed in the same manner with an adapted shape of the two beams. The pusher beam pushes the row of stones or bricks lying before it up to a fixed position on the pattern forming table. The previously formed rows, which during formation are supported at the back by the retaining beam, which during the process is incrementally moved backwards, are incrementally pushed up until a complete laying unit 43 has been formed. The pusher beam now moves back and starts the formation of a next laying unit. At the same time, the retainer beam pivots out of the way, and the laying unit formed is positioned on a pallet on the side of the road. For this transport the pattern forming machine is equipped with a crane 10 with appropriate clamping means 44 attached thereto.

Fig. 3 further shows diagrammatically, at 45 and 46, the drive units, for example, a hydraulic unit and a diesel engine.

The various conveyors used in the mobile pattern forming machine may be of any existing type. Preferred conveyors are those equipped with fingers or similar retainers or conveyors of the leap-frog type. The tipping device may be constructed in any known manner, and so can the dimensional inspection station.

It is noted that various modifications of the invention described will readily occur to those skilled in the art after reading the above. Such modifications are deemed to fall within the scope of the present invention.

Claims

1. A method of re-paving roads paved with paving stones or bricks, in which the stones or bricks are taken up from the existing paving, cleaned and stored, the sand bed is prepared, and the stones or bricks are re-laid, characterized in that the cleaned stones or bricks are supplied to a mobile pattern forming machine positioned on the sand bed between the old paving and a part of the road already re-paved, and that, in said mobile pattern forming machine, the stones or bricks are automatically and one by one passed along a visual inspection station and put in a desired position, and subsequently are automatically supplied to a section of a pattern forming table constituting part of said pattern forming machine, where the stones or bricks are automatically formed into laying units, which are stacked alongside the road and subsequently picked up by a paving machine positioned on a portion of the pavement already re-paved, and laid on the meanwhile levelled sand bed between the mobile pattern forming machine and the re-paved road surface.

2. A method as claimed in claim 1, characterized in that, in said visual inspection station, the stones or bricks are inspected for clearly visible defects by an operator of the mobile pattern forming machine and that simultaneously the position of each stone or brick is determined, whereafter the approved stones or bricks are automatically put into the correct position and the rejected stones or bricks are carried off.

3. A method as claimed in claim 1 or 2, characterized in that, before being supplied to the pattern forming table, the stones or bricks pass an automatic dimensional inspection station where stones or bricks with deviating dimensions are removed.

4. A mobile pattern forming machine for use in the method as claimed in claim 1, 2 or 3, characterized by a hopper, a first conveyor for supplying stones or bricks from said hopper to a visual inspection station; means for putting the stones or

bricks in the correct position and supplying them to a dimensional inspection station; and means for transporting the stones or bricks having the correct dimensions to a pattern forming table for forming a plurality of bricks into a laying unit.

5. A mobile pattern forming machine as claimed in claim 4, characterized in that said first conveyor comprises at least one conveyor for supplying the stones or bricks to a second, small hopper tapering towards a second conveyor arranged to transport the stones or bricks diagonally upwardly, said second conveyor including compartments each capable of accommodating a stone or brick with its longitudinal axis transverse to the direction of transport, and which is arranged to supply the stones or bricks to said visual inspection station.

6. A mobile pattern forming machine as claimed in claim 4 or 5, characterized by the provision of at least one ejector member disposed in the vicinity of said visual inspection station and arranged to supply the stones or brick one by one to a tipping device which tips each stone or brick about its longitudinal axis such a number of times that it comes to lie with the correct side up, and also arranged to supply rejected stones or bricks to the waste container.

7. A mobile pattern forming machine as claimed in claim 6, characterized by the provision of at least one ejector member disposed in the vicinity of said tipping device and arranged to move the approved stones or bricks, which are disposed in the correct position, on to a third conveyor placed next to said tipping device, which third conveyor is arranged to supply the stones or bricks one by one to an automatic dimensional inspection station.

8. A mobile pattern forming machine as claimed in claim 7, characterized by the provision of an ejector member mounted downstream of said dimensional inspection station and arranged to move stones or bricks with the correct dimensions from said third conveyor on to a fourth conveyor arranged to supply the stones or bricks to the pattern forming table.

9. A mobile pattern forming machine as claimed in any of claims 4-8, characterized in that the pattern forming table comprises a fingered conveyor arranged to form from a plurality of successively supplied stones or bricks a row of stones or bricks disposed in a desired position and in a desired spaced relationship; a pusher beam arranged to push each row of stones or bricks thus formed into the desired pattern and to shift it on to a fixed position on the pattern forming table to form laying units.

10. A mobile pattern forming machine as claimed in any of claims 4-9, characterized by a crane mounted on said mobile pattern forming machine, said crane including a stone or brick engaging clamping means, and being arranged to pick up a ready laying unit and position the same next to the mobile pattern forming machine.

5

10

15

20

25

30

35

40

45

50

55

5

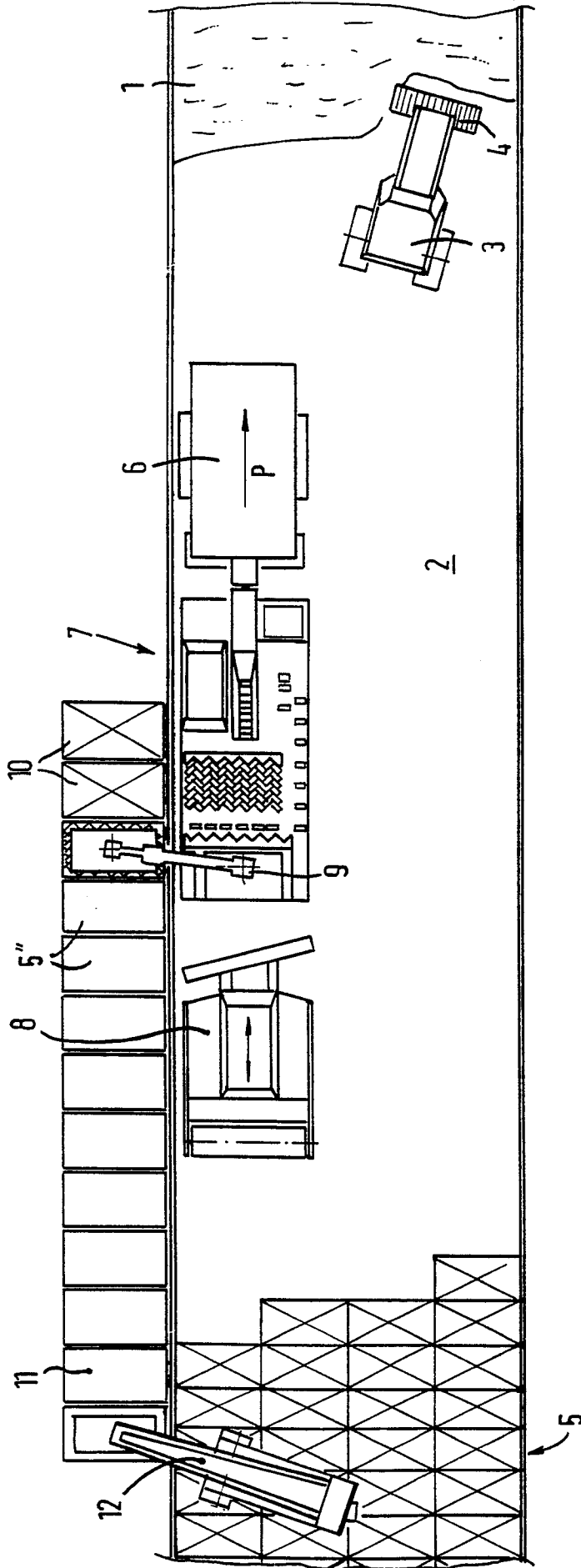


fig.1

fig.2

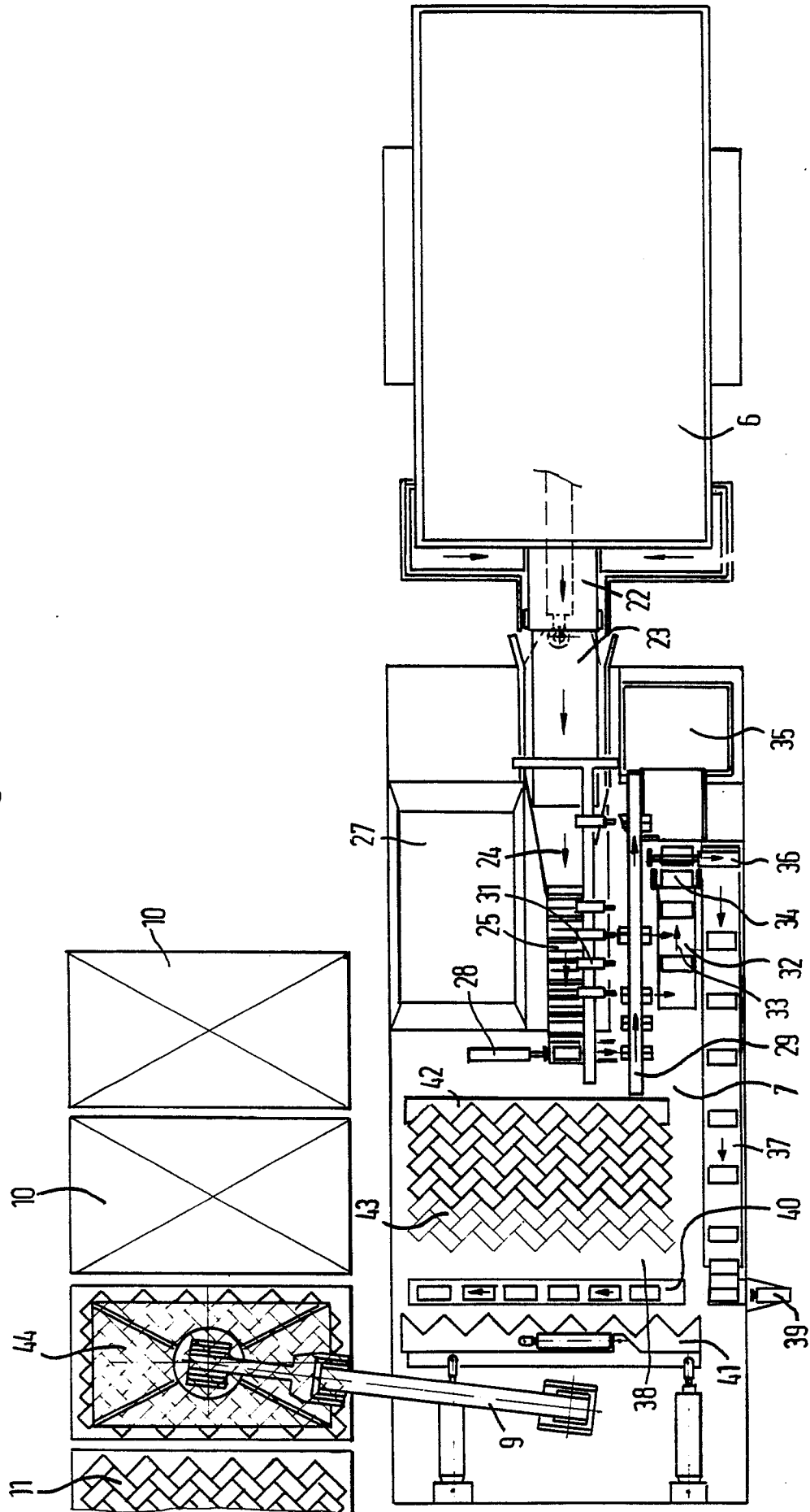
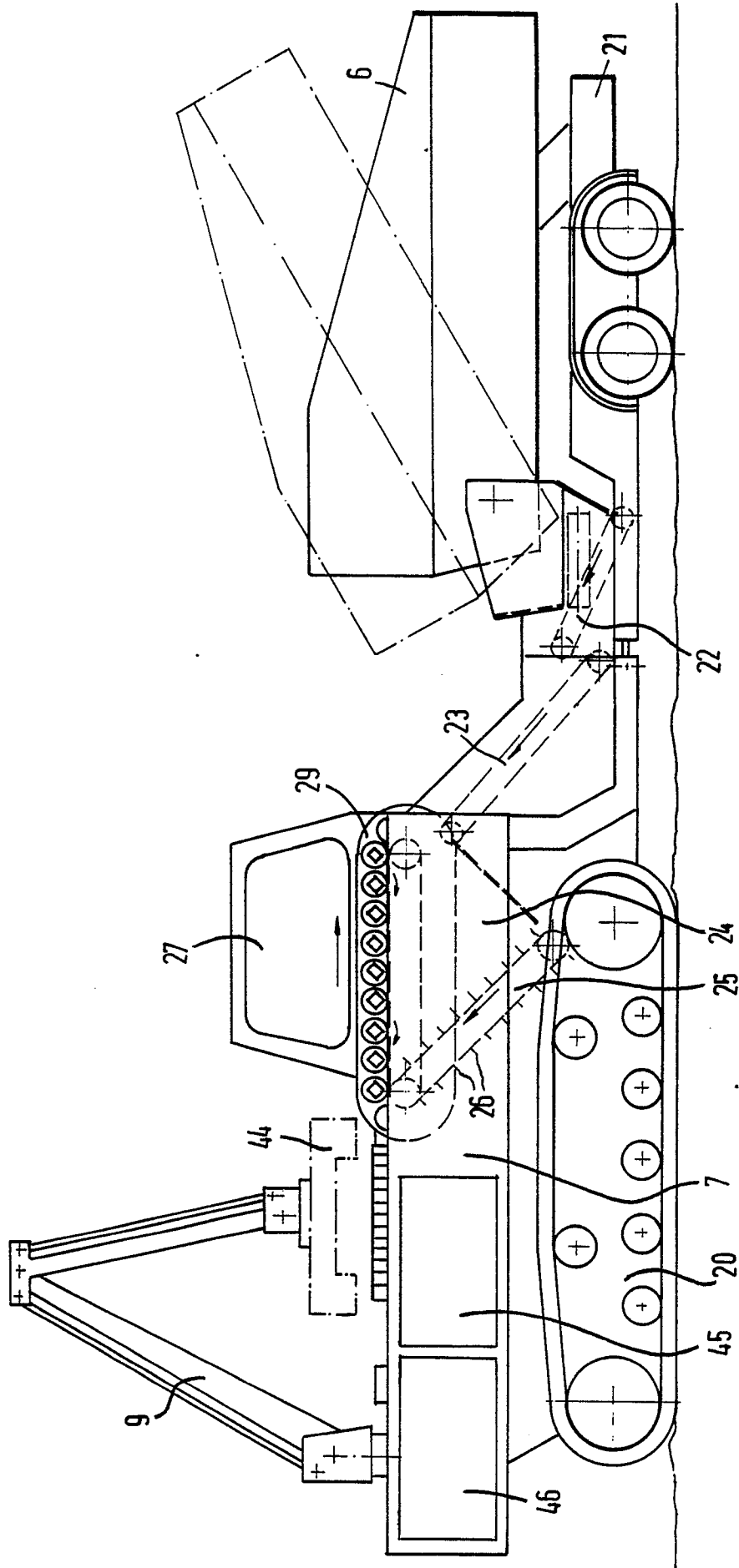


fig.3





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	EP-A-0 164 146 (LUYTEN) * Whole document *	1	E 01 C 19/52 E 01 C 23/12 E 01 C 19/00
A	--- EP-A-0 047 041 (VAN DALESEN) * Abstract; figures *	1	
A	--- DE-A-2 335 183 (FORSCHUNGSGRUPPE)		
E	--- NL-A-8 500 418 (INGENIEURSBUREAU HET NOORDEN) * Whole document *	1-10	

			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			E 01 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 06-04-1987	Examiner DIJKSTRA G.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	